통증 및 근골격재활
발표일시 및 장소 : **10 월 26 일(금) 14:39-14:51 Room E(5F)**

OP- Scientific 2-3

Eletromyographic analysis of paraspinal muscles in adolescents with idiopathic scoliosis

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Background and aim(s)
Many studies have been done to reveal the etiology of adolescent idiopathic scoliosis(AIS), but its pathogenesis is still poorly understood. As it possible to measure activity of paraspinal muscles using surface electromyography(S-EMG), several studies found out that the S-EMG activity increased on the convex side of the scoliotic curve and suggested paraspinal muscle asymmetry as a cause of IS. Therefore, we assumed that curve patterns of scoliosis is relate with concave side muscle weakness. The first purpose of this study was to find out the association between paraspinal muscle imbalance and scoliosis curve type. The second, based on the Results of the S-EMG mentioned above, we tried to develop an exercise protocol for IS using asymmetric spinal stabilization exercise, depending on the type of spinal curvature and paraspinal muscles asymmetry.

Method
The study design was prospective clinical trials. S-EMG was used to evaluate the muscular activation at bilateral erector spinae (ES) on three vertebral levels(7th, 12th thoracic, 3rd lumbar). The curve type was measured in simple radiograph. Curve types were defined on the basis of the Scoliosis Research Society Classification Definitions.

Result(s)
Between February 2017 to June 2018, 29 patients included in the primary analysis(Fig. 1). Table 1 shows the result of th mean RMS S-EMG values(S.D.) of the paraspinal muscles of the concave and convex side . In thoracolumbar type, the activity of EST12 muscles was significantly different between the convex and concave sides(convex/concave : 126.66 ± 28.38/97.66 ± 25.28, p value = 0.043). There was increased mean RMS in the convex side. At the levels of EST7 and ESL3, there were no significant differences. There was significant difference in ESL3 in lumbar type(convex/concave side: 59.40 ± 11.41/50.60 ± 17.90, p value = 0.043) and no differences in other level. In double major type, the muscle activity also displayed a significant difference in EST7 and ESL3, where the apex of curve present(EST7 convex/concave : 261.20±121.20/161.33±58.33, p value = 0.001, ESL3 convex/concave : 134.12±61.68/85.42±37.06, p value = 0.002). Besides, there were no significant differences between the convex and concave sides in single thoracic and double thoracic types. Considering the difficulty of obtaining statistical significance due to few cases, we combined types and analyzed them as groups based on the level with

apex located. Table 2 shows the S-EMG data on thoracic, thoracolumbar and lumbar curve groups. EST7 showed most significant differences in thoracic group and other findings showed same Results in thoracolumbar and lumbar groups.

Conclusion(s)

The paraspinal muscle asymmetry well reflected the curve type on this study. Based on these findings, we propose a new exercise protocol to carry out the asymmetrical stabilization exercise of the scoliosis according to the asymmetrical paraspinal muscle weakness.

Table 1 show the result of th mean RMS S-EMG values(S.D.) of the paraspinal muscles of the concave and convex side according to the type of scoliosis

		Mean RMS			
SRS type	N	Muscle lesion	Concave side[μV]	Convex side[μV]	P-value
Single Thoracic	5	ES, T7	161,48±180,28	197,04±158,96	0,080
		ES, T12	92,46±39,59	80,50±41,16	0,686
		ES, L3	85,42±48,46	94,50±35,85	0,686
Thoracolumbar	5	ES, T7	238,92±115,08	184,52±80,68	0,686
		ES, T12	97,66±25,28	126,66±28,38	0,043*
		ES, L3	111,48±40,42	101,94±43,46	0,500
Lumbar	5	ES, T7	196,02±51,41	159,32±39,12	0,080
		ES, T12	83,18±25,26	102,88±14,82	0,225
		ES, L3	50,60±17,90	59,40±11,41	0,043*
Double Major	11	ES, T7	161,33±58,33	261,20±121,20	0,001*
		ES, T12	124,47±67,91	136,16±52,64	0,532
		ES, L3	85,42±37,06	134,12±61,68	0,002*
Double Thoracic	2	ES, T7	215,15±90,58	267,10±148,35	0,180
		ES, T12	147,10±28,71	196,55±47,59	0,180
		ES, L3	143,25±21,43	129,65±28,71	0,180

Data are expressed as mean ± SD, * $p < 0,05$

Table 2 show the result of th mean RMS S-EMG values(S.D.) of the paraspinal muscles of the concave and convex side according to the group of scoliosis

		Mean RMS			
Curve group	N	Muscle lesion	Concave side[μV]	Convex side[μV]	P-value
Thoracic curve (ST, DM, DT)	18	ES, T7	167,35±102,15	244,03±129,55	0,000*
		ES, T12	118,09±58,73	127,41±58,49	0,471
		ES, L3	91,84±41,68	122,62±53,84	0,002*
Thoracolumbar curve (TL, DT)	7	ES, T7	232,13±101,64	208,11±98,14	0,866
		ES, T12	111,79±33,85	146,63±45,58	0,018*
		ES, L3	120,56±37,50	109,86±39,24	0,310
Lumbar curve (L,DM)	16	ES, T7	172,17±57,00	229,36±112,16	0,030*
		ES, T12	111,57±60,30	125,76±46,47	0,288
		ES, L3	76,32±35,29	122,72±69,62	0,001*

Data are expressed as mean ± SD, * p < 0,05

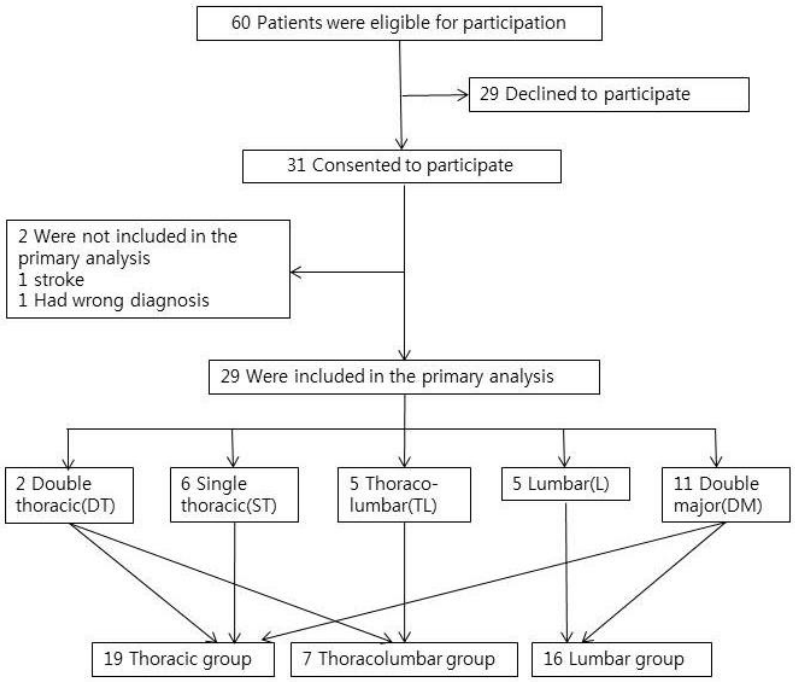

Figure 1. Study Enrollment and classification of the Patients. Between February 2017 to June 2018, a total of 60 patients underwent screening. Of those, 29patients declined to participate and 2 were excluded in the primary analysis. A total of 29 patients included in the primary analysis.